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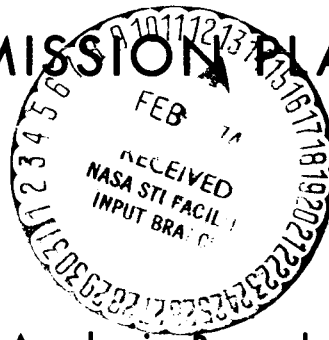
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APOLLO 11

(MISSION G)

ALTERNATE MISSION PLAN



Lunar Mission Analysis Branch

Orbital Mission Analysis Branch

MISSION PLANNING AND ANALYSIS DIVISION

   
MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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PROJECT APOLLO

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By Lunar Mission Analysis Branch and  
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MISSION PLANNING AND ANALYSIS DIVISION  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

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# APOLLO 11 (MISSION G) ALTERNATE MISSION PLAN

By Lunar Mission Analysis Branch  
and Orbital Mission Analysis Branch

## 1.0 INTRODUCTION

The Apollo 10 operational alternate mission plan (ref. 1) is also the basic plan for Apollo 11 (Mission G) alternates. There are some deletions, additions, and changes, however. The purpose of this document is to describe the guidelines and summarize the lunar and earth orbit alternates that are applicable for Apollo 11 (Mission G).

No additional documents are to be issued for Apollo 11 (Mission G) alternate missions. The trajectory portions of the alternate missions have been moved into the realm of real-time planning. The only preflight effort will be in defining guide lines and selecting sites for lunar orbit photographic coverage.

## 2.0 ABBREVIATIONS

CLA	contingency landing area
CSM	command and service modules
DPS	descent propulsion system
LM	lunar module
LOI	lunar orbit insertion
MCC	midcourse correction
PC	plane change
SPS	service propulsion system
T, D, and E	transposition, docking, and extraction

TEI                transearth injection  
 TLI                translunar injection

### 3.0 EARTH ORBIT ALTERNATES

The earth orbit alternate missions plan for Apollo 11 (Mission G) consists of two basic types of alternates:

1. A low earth orbit with CSM-only or CSM/LM operations
2. A semisynchronous orbit with CSM-only or CSM/LM operations

These alternates are preflight plans and could be altered in real time to meet additional system tests or scientific experiment requirements.

Since the completion of a successful F-type mission, the need for certain CSM and LM system test requirements has been removed. Because of this, the alternate mission plans for the Apollo 11 (Mission G) and subsequent lunar landing missions have been simplified.

It is felt that there is still need for as much CSM systems flight time as possible; this feeling is prompted by certain CSM systems component failures on Apollo 10. Therefore, alternates 1 and 2 of the F mission alternate plan remain for Apollo 11 (Mission G) and, tentatively, in subsequent missions. Since as much systems' time as possible is desirable, the alternate missions are planned to be open-ended up to 10 days, as they were for Apollo 10.

Alternates 3 and 4 of the Apollo 10 alternate mission plans consist of combined CSM/LM operations in low earth orbit (alternate 4 requiring both DPS and SPS burns to return to a low earth orbit following a partial TLI). These missions remain in Apollo 11 (Mission G) alternate mission plans, with the exception of no preflight planning of a LM-active rendezvous. However, this does not exclude the possibility of some sort of limited rendezvous being planned in real time.

Alternate 5 of the Apollo 10 alternate mission plans consists of combined CSM/LM operations in a high apogee, semisynchronous (12-hour period) orbit. This mission remains in Apollo 11 (Mission G) alternate plans.

### 3.1 Conclusions

The earth orbit alternate missions proposed for Apollo 11 (Mission G) consist of two basic types of missions:

1. A low earth orbit with or without the LM (alternates 1, 3, and 4)
2. A high apogee semisynchronous orbit with or without LM operations (alternates 5 and 2, respectively).

These alternates are essentially the same as those planned for Apollo 10, with the exception of a preflight planned rendezvous exercise. It should be noted that any earth-orbit alternate mission would be planned to a great extent in real time, following the basic sequence detailed in reference 1.

### 4.0 LUNAR ORBIT ALTERNATES

The Apollo 11 (Mission G) lunar alternate missions will basically be a subset of the Mission F lunar alternate candidates. The guidelines for these alternates are as follows:

1. LM testing still has priority over a CSM-only mission. Specifically, a long docked DPS burn would be highly desirable.
2. There should not, of course, be any impact on crew training.
3. A lunar orbit mission without a landing is an acceptable alternate within certain restrictions. There appears to be little justification for simply going into lunar orbit and flying a groundtrack that we have flown before. The decision to commit to a lunar orbit mission should be based on the capability to achieve significant photographic and navigational objectives. On the first day of the Apollo 11 (Mission G) launch window, this would require the capability to go to higher inclination lunar orbits to photograph and perform sextant tracking on future landing sites (such as Hipparchus, Hyginus, etc.). On subsequent days in the window, there would be a tradeoff between mapping sites 4 and 5 versus future landing sites. In certain situations, both could be performed; this depends on the  $\Delta V$  available. The Lunar Mapping Sciences Division is compiling list of sites in order of priority for which further photographic coverage is desired.
4. Due to the practically infinite number of possible lunar orbit inclinations and node positions, all trajectory planning will be performed in real time.

5. In lunar orbit, the nominal crew rest/work cycle should be followed as closely as possible.

6. In lunar orbit, if the LM is NO-GO for a landing, then the alternate mission would be a DPS TEI. No rendezvous mission would be flown. This does not preclude undocking if some LM checkout test could be achieved.

Within these guidelines, the alternate missions will be planned in real time, based on the particular contingency situation. The following is a brief summary of the alternates.

#### 4.1 Alternate 1

Contingency: Non-nominal TLI

Alternate 1(a): DPS LOI mission

Alternate 1(b): CSM-only lunar orbit mission

##### 4.1.1 Mission profile.-

Alternate 1(a):

1. DPS LOI-1, SPS LOI-2
2. SPS plane change for site coverage
3. SPS burn into 60-by 8-n. mi. orbit for three revolutions of low orbit navigation

Alternate 1(b):

1. SPS LOI-1, LOI-2
2. Plane change for site coverage
3. SPS burn into 60-by 8-n. mi. orbit for three revolutions of low orbit navigation

Comments:

1. Same constraints on DPS LOI as Apollo 10
2. If the decision were made not to use the DPS for LOI but

it was still GO for a burn, the priority would still be LM testing. Rather than stage the LM and do a CSM-only lunar orbit mission, a CSM/LM flyby would be flown with a DPS midcourse to a CLA (either at LOI minus 5 hr or PC plus 2 hr).

3. Alternate 1(b) would only be flown if the LM was NO-GO for a docked DPS burn.

#### 4.2 Alternate 2

Contingency: Failure to perform T, D, and E

Alternate 2: CSM-only lunar orbital mission

#### 4.3 Alternate 3

Contingency: LM NO-GO for landing

Alternate 3: Docked DPS TEI

Mission Profile<sup>a</sup>:

1. SPS plane change for site coverage
2. SPS burn to place CSM/LM in a 60 by 8-n. mi. orbit
3. SPS circularization in 60-n. mi. orbit
4. DPS TEI
5. SPS MCC for return to CLA as soon as possible

<sup>a</sup>These are actually optional profile considerations.

## REFERENCE

1. DeAtkine, David D.: Apollo 10 (Mission F) Spacecraft Operational Alternate Mission Plans, Volume I - Earth Orbit Alternates. . . : MSC IN 69-FM-82, April 10, 1969.